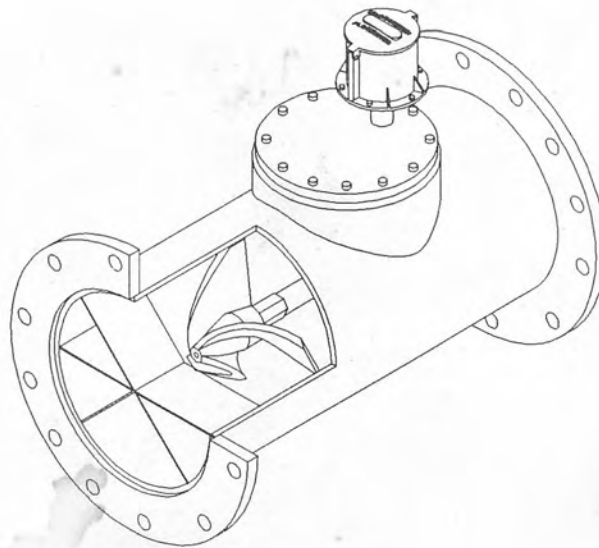


McCROMETER Propeller Flowmeters

Manual for

Installation, Operation & Maintenance

Revised November 1991



GREAT PLAINS METER

SALES - SERVICE - TESTING

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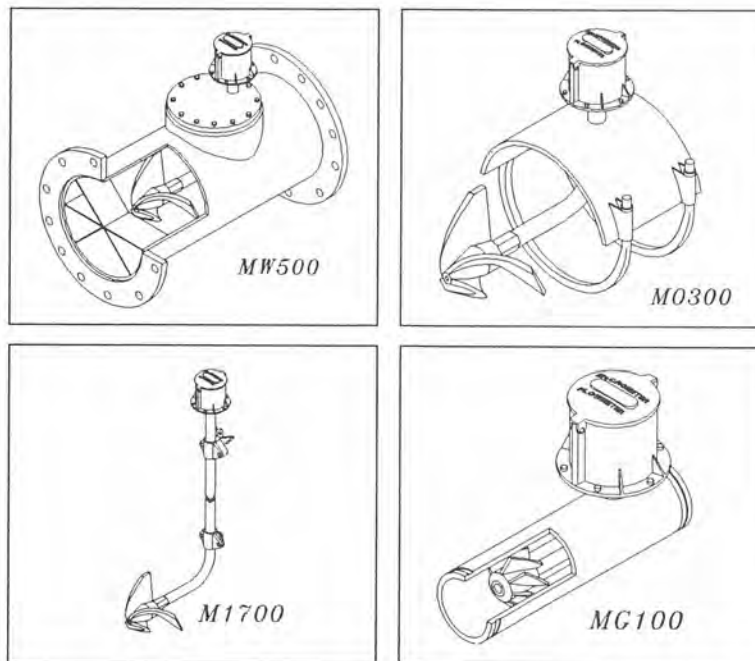
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PROPELLER FLOWMETERS

INTRODUCTION

Propeller flowmeters are widely accepted as a proven technology for measuring flow with high accuracy and excellent repeatability. Ketema/ McCrometer Division produces propeller flowmeters used around the world for agricultural, municipal, and industrial applications.



TYPICAL APPLICATIONS INCLUDE

- Drip irrigation systems
- Plant effluent
- Sprinkler irrigation systems
- Raw water intake
- Center pivot systems
- Hot water & petroleum mixtures
- Farm turnouts from irrigation districts
- Process batching & chemical feed
- Golf course and park management
- Remote indication, totalizing, & recording
- Commercial nurseries
- Multi-stage pump actuation and control
- Valve actuation and control
- Return activated sludge
- Water and wastewater management

PRINCIPLES OF OPERATION

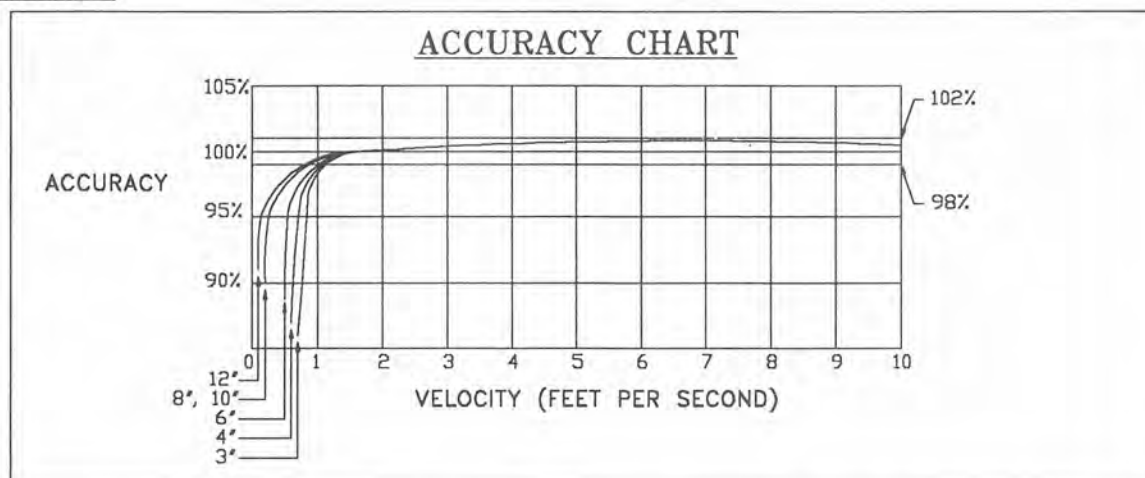
The measuring element of a propeller flowmeter consists of a rotating device, called a rotor or propeller. Positioned in the center of the flowstream, the propeller rotates at a velocity proportional to the velocity of the fluid through the flowmeter. This rotation can be transmitted mechanically to a register assembly and the fluid's volumetric flowrate and accumulated volume can then be displayed.

GENERAL SPECIFICATIONS

Sizes Available	2" to 96"
Flowrates Available	35 to 75,000 GPM
Turndown	up to 15:1
Accuracy	$\pm 2\%$
Repeatability	$\pm 0.25\%$
Rated Pressure	150 PSI
Rated Temperature	160 °F

DESCRIPTIONS:

- **TURNDOWN:** Propeller meters are specified to work within a certain range of flowrates. Turndown is the ratio of the maximum flowrate to the minimum flowrate of the meter. A typical turndown is 15:1. (i.e., max. flow = 1500 gpm to min. flow = 100 gpm)
- **ACCURACY:** Accuracy shows how close the measurement of the meter is to the actual flow in the pipe. Within its turndown (described above), the reading of the meter is guaranteed to be $\pm 2\%$ of the actual flow.
- **REPEATABILITY:** Flowmeter repeatability is the ability of a meter to reproduce a measurement under similar conditions. This is not a measure of accuracy. McCrometer propeller meters have a repeatability of $\pm 0.25\%$.
- **PRESSURE:** The pressure rating for standard propeller meters is 150 PSI. This pressure rating refers to the constant line pressure in the pipe. Some models can be rated up to 300 PSI. Higher pressures are available on special request.
- **TEMPERATURE:** The temperature rating for standard propeller meters is 160 °F constant temperature. This temperature rating refers to fluid temperature. Most standard models can be upgraded to 240 °F constant temperature on special request.

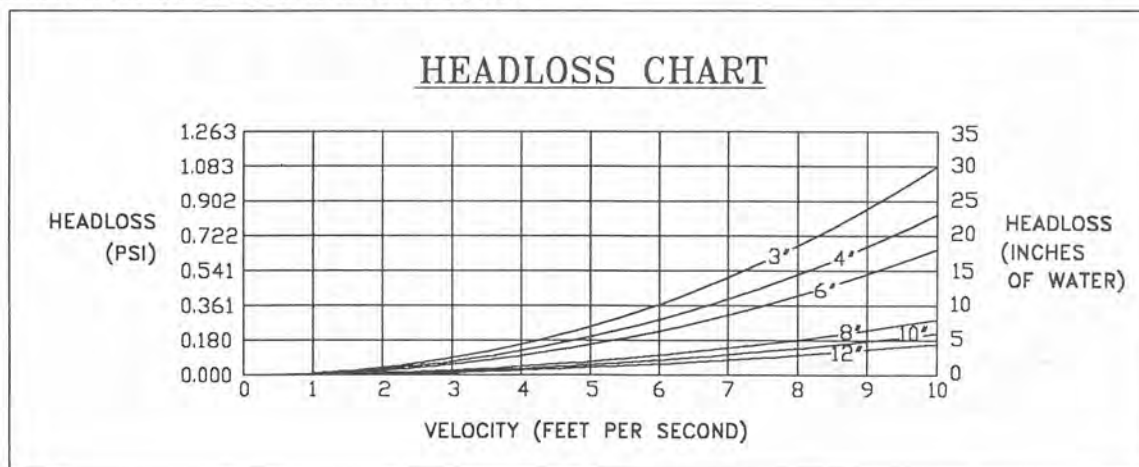
ACCURACY

Standard flowrates for McCrometer propeller meters are shown below. Readings are guaranteed accurate within $\pm 2\%$ in these flowrates. Please note that over 80 percent of the meter's flow range, the accuracy is better than $\pm 1\%$.

Nominal Meter Size	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Minimum Flow (U.S. GPM)	35	35	35	50	90	100	125	150	250	275	400	475	700
Maximum Flow (U.S. GPM)	250	250	250	600	1200	1500	1800	2500	3000	4000	5000	6000	8500

HEADLOSS

Headloss refers to the fluid pressure lost due to the meter. Propeller meters have very low permanent headloss as seen in the chart below.

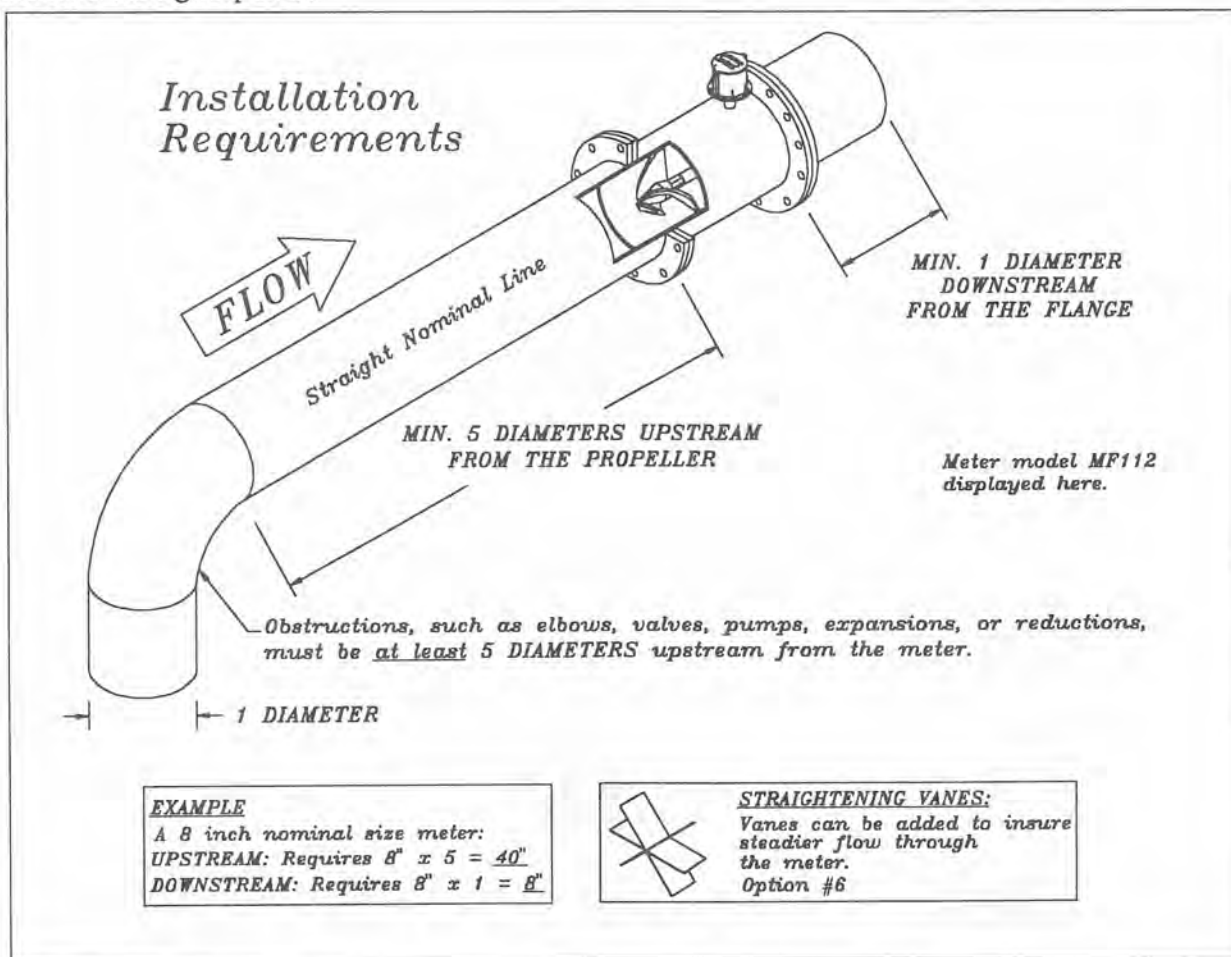


Nominal Meter Size	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Max. Headloss (in. H ₂ O column)	30	23	17	7	4	3	2	2	2	1	1

INSTALLATION INSTRUCTIONS

Proper meter installation is the first step to insure excellent meter performance. Follow these instructions closely. Consult an authorized service representative or the factory for any circumstances encountered not covered in this manual.

All McCrometer products are tested and inspected during manufacture and prior to shipping. An inspection should be performed at the time of unpacking to detect any damage that might have occurred during shipment.



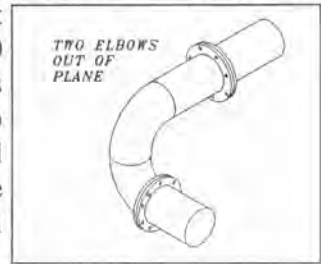
Installation requirements

Fig. 1

McCrometer propeller meters should be installed a minimum of five diameters downstream of any obstructions. Flowmeters are velocity sensing devices and are vulnerable to certain upstream disturbances. Because of this, meters need certain lengths of straight pipe runs before and after the meter. These distances usually relate to the diameter of the pipe used. Obstructions can include elbows, valves, pumps, and changes in pipe diameter. The uneven flow created by these obstructions can vary with each system. If your application provides for more than five diameters of upstream run, use the available distance.

Downstream run should be one diameter of straight pipe length after the meter.

NOTE: Special attention should be given to systems using two elbows "out of plane" or devices such as a centrifugal sand separator. These cause swirling flow in the line that affect propeller meters. Well developed swirls can travel up to 100 diameters downstream if unobstructed. Since most installations have less than 100 diameters to work with, straightening vanes become necessary to alleviate the problem. Straightening vanes will break-up most swirls and ensure more accurate measurement. McCrometer's mainline meters like the MW500 series have vanes included as a standard feature. If your model does not have straightening vanes (e.g., MO300 Bolt-On Saddle series), McCrometer actively encourages you to include them in the pipe just ahead of the meter.



OTHER INSTALLATION CONSIDERATIONS

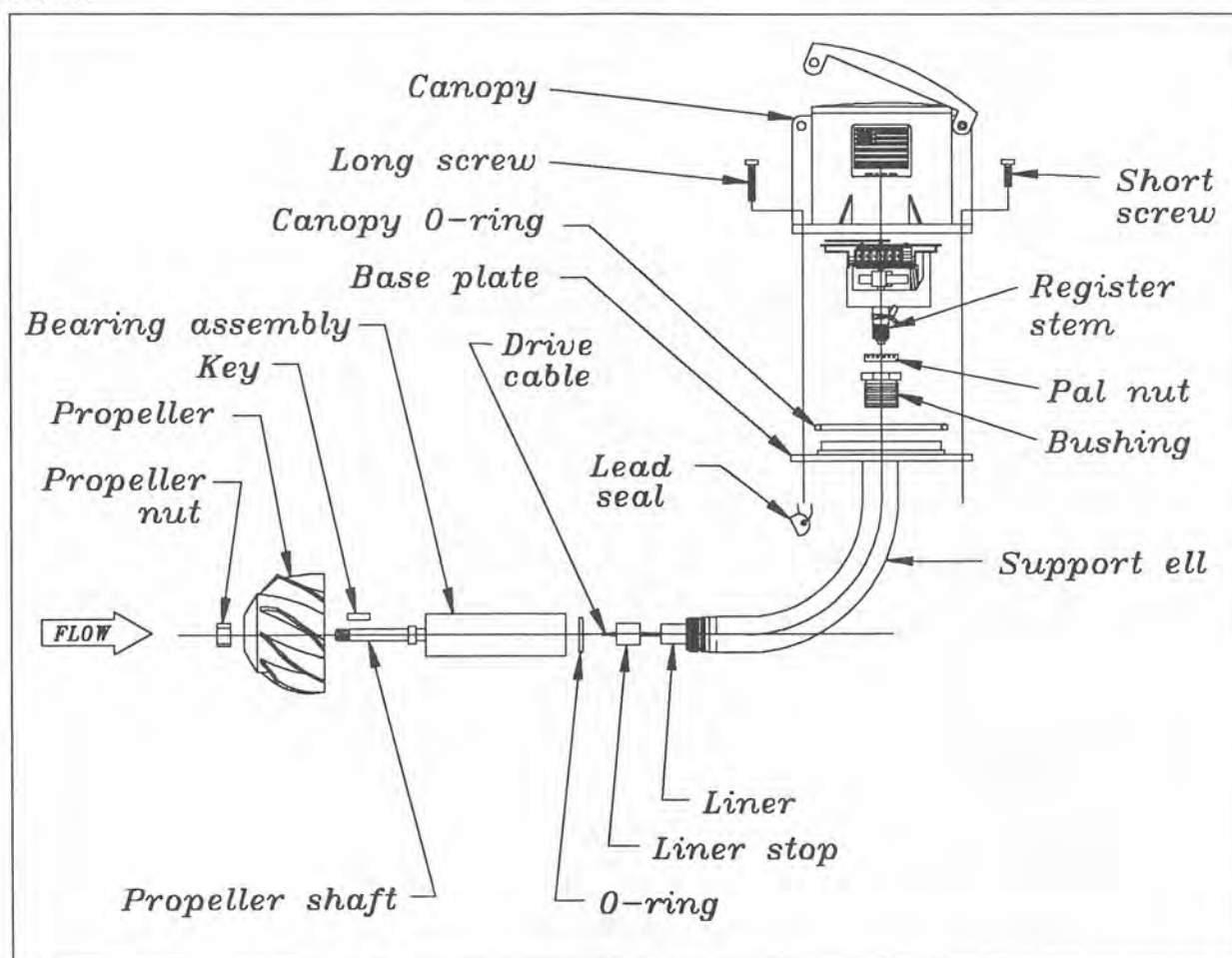
- All propeller flowmeters are calibrated for a full pipeline. If the pipe isn't completely full, the flowmeter will over-register the flow. Although a minimum line pressure isn't necessary for an accurate measurement, a full pipe is!
- McCrometer flowmeters can be mounted either horizontally or vertically. Although most applications are horizontally oriented, mounting the meter vertically actually offers some slight advantages. One reason is that gravity has a more pronounced flow-conditioning effect with lines in the vertical (as opposed to horizontal) orientation. The intended configuration of the meter must be specified when ordering.
- With the meter installed, check the rate-of-flow indicator. It should be stable to the point that it can be easily read. Some movement is normal, but if the indicator is moving erratically back and forth, disturbances exist and meter accuracy decreases. If you suspect a problem, please refer to the INSTALLATION INSTRUCTIONS section or the MAINTENANCE AND TROUBLESHOOTING section.

SAFETY

- Any person installing, inspecting, or maintaining a McCrometer flowmeter should have a working understanding of piping configurations and systems under pressure.
- Before adjusting or removing any meter, be certain the system has depressurized completely. **NEVER ATTEMPT TO REMOVE A METER UNDER PRESSURE!**
- Be careful when lifting meters. Meters can cause serious injury if dropped or lifted incorrectly.
- Only necessary and appropriate tools should be used when working on a meter. For tools list see page 10.
- Before starting a system, make sure all connections are properly secured. Keep a safe and prudent distance away from the meter during system start-up.

METER CONSTRUCTION

Every McCrometer propeller meter is constructed and assembled at the Ketema/ McCrometer factory. Each part of your meter has been refined and improved over thirty years. Quality assurance at each step of the production process insures every meter to be accurate and reliable for years of service.

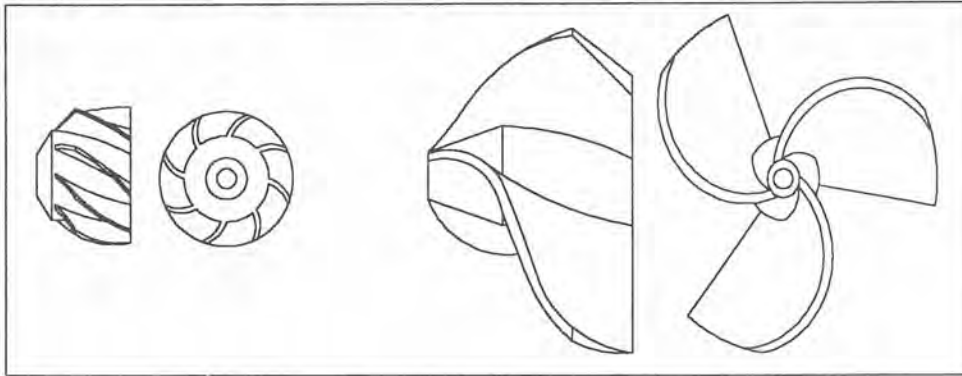


Basic meter element assembly Fig. 2

McCrometer propeller meters have a simple design with a limited number of moving parts. Figure 2 shows labeled parts that are commonly shared among models. Though different models may look somewhat different than the model shown above, each shares certain components. These components are described in detail on the following pages.

PROPELLER

The propeller is, of course, a most important part of any propeller meter.



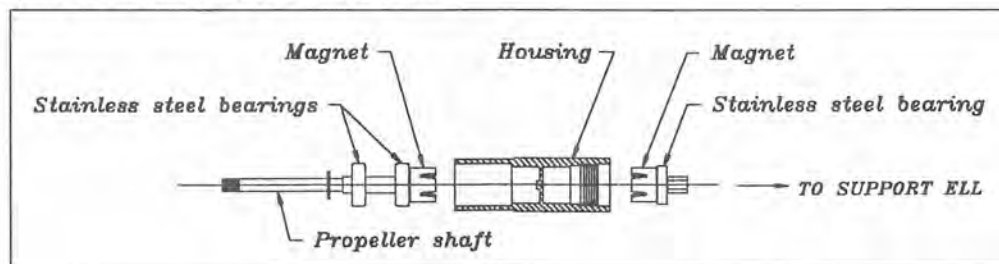
Eight and three blade propellers Fig. 3

McCrometer propellers have the following characteristics that insure accurate readings:

- Each propeller is wet-calibrated in a NIST (National Institute of Standards and Technology) traceable laboratory and trimmed so that a standard ratio is achieved. This allows for easy parts replacement in the field without recalibration.
- Propellers have a curved shape called the helical lead. The helical lead governs the rotational speed for a given flow velocity. All propellers have the helical lead, despite the number of blades (3, 4 or 8).
- Propellers are as light as possible so that the momentum of the fluid is large in relation to the mass of the propeller. As a result, lower flows can be measured and changes in velocity can be detected more rapidly.
- The propeller is sufficiently rigid to retain its shape during high flow conditions throughout the life of the meter.
- Propellers are large in relationship to the line size. This is necessary to affect the whole flow, which both averages the velocity profile and reduces inaccuracy.
- The propeller covers and protects the bearings to reduce debris and other fluid particles from entering the bearing assembly.

BEARING ASSEMBLY

Two shielded, stainless steel bearings support the propeller shaft and allow it to rotate freely. The propeller covers the bearings to help prevent loss of lubrication and entry of foreign particles found in the fluid. For higher than normal flows, a third over-run bearing can be added to the propeller shaft to increase the life of the meter.



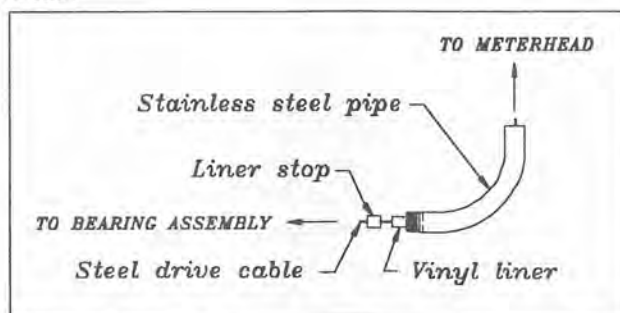
Bearing assembly

Fig. 4

The bearing assembly housing prevents the process fluid from entering the drive assembly. The housing is manufactured with an integral diaphragm separating the fore and aft sections. Two permanent magnets on either side of the diaphragm transmit the rotation of the propeller through the diaphragm, while preventing fluid from entering the aft chamber. This magnetic drive makes an excellent and frictionless seal. This connection also allows the magnets to slip if a sudden surge hits the propeller. This slippage protects the meterhead from excess torque. Sealed bearings are available as an option. The bearing assembly threads onto the drive assembly support and seals with an O-Ring. This is the only seal in the flowstream, a unique McCrometer design.

DRIVE ASSEMBLY

The drive assembly supports the bearing assembly and propeller and transmits propeller revolutions to the meterhead.



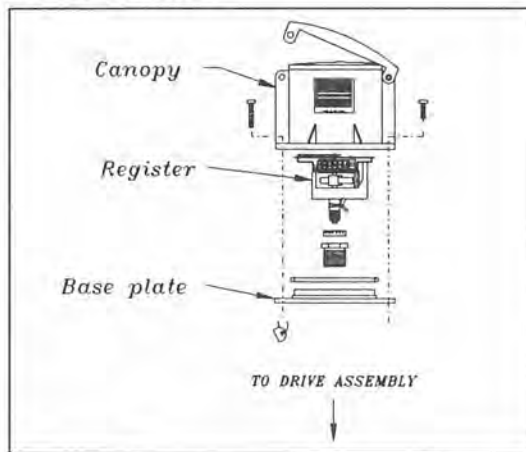
Drive assembly

Fig. 5

A heavy-walled stainless steel pipe cold-formed into an ell (90 degree) shape supports both the bearing assembly and the propeller. This ell holds a steel cable encased in a protective vinyl liner. The cable extends outside the liner to attach to the aft of the bearing assembly and the bottom of the meterhead to transmit the revolutions of the propeller to the register. This unique cable design eliminates troublesome and costly worm and bevel gears resulting in a meter that has less than half the moving parts of other propeller meters.

METERHEAD

The meterhead consists of a register, canopy, and a base plate. The register transforms the speed of the propeller into both a totalizer and an instantaneous flow indicator. McCrometer's totalizers are six-digit, straight reading type. Units of totalization include many standard units such as gallons, cubic feet, acre feet, and cubic meters.



Meterhead

Fig. 6

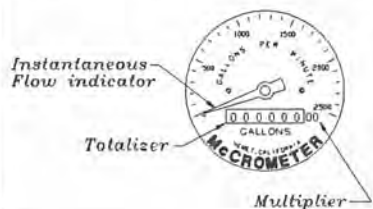
The instantaneous flow indicator is of the mechanical magnetic cup design. Indicator units include gallons per minute, cubic feet per second, and liters per second, as well as many others. McCrometer offers this instantaneous flow indicator standard.

The entire register threads into a bushing which holds a die cast aluminum base plate to the ell where it connects with the drive cable. The base plate seals to the ell with an O-Ring and Gasket. A die-cast aluminum canopy covers the register and attaches to the base plate with six screws. A stamped lead seal attached to one of these screws insures that the instrumentation of the register remains unaltered.

UNDERSTANDING THE REGISTER GEAR RATIO:

Each register has a gear ratio that is matched to the propeller. For instance, consider an 8" McCrometer meter totalizing in gallons. This meter will have a gear ratio of 400:1, which means the propeller must rotate 400 times for the first odometer wheel to turn one complete revolution. This first odometer wheel usually symbolizes a certain multiple of the totalizing units, called a multiplier. Since the totalizer on the 8" meter has a multiplier of times 100 (signified by two zeros to the right of the odometer wheels), each number on the first odometer wheel represents one hundred gallons. Therefore, one complete rotation of the first odometer wheel is ten times one hundred gallons, or 1000 gallons. So remembering the gear ratio for this example is 400 propeller revolutions to one full turn of the odometer wheel, 400 propeller revolutions equals 1000 gallons.

Example: 8" meter: 400 propeller rev. = 1 rev. of odometer wheel = 1000 gallons



NOTE Each line size has its own gear ratio. Registers from different size meters cannot be interchanged freely.

Be sure you know your meter's gear ratio and multiplier for reference.

MAINTENANCE AND TROUBLESHOOTING

Ketema/ McCrometer Division manufactures its propeller meters to be as trouble free as possible. The first criteria in a successful meter application is that the meter is installed correctly. Please refer to the earlier Installation Instructions or call an authorized service representative or the factory to answer any questions.

OCCASIONAL INSPECTIONS

Our flowmeters commonly operate for years with little or no routine maintenance. Occasional inspections should be conducted to listen and look for signs of mechanical wear and breakage.

- McCrometer flowmeters operate very quietly and any grinding or growling noises that can be detected are the first signs that mechanical failure is near.
- Visual cues are also valuable indicators. A once steady rate-of-flow indicator that has become erratic is usually indicative of something beginning to fail. Fogging seen through the lens would suggest a leak, either from the bearing assembly, or from an external seal.
- If there is doubt whether your rate-of-flow indicator is properly functioning, perform this simple test. Bring the flow through the meter to a relatively high, steady rate. Time a specific increment of the totalizer wheel. Each meter will require different but simple calculations to determine if your rate-of-flow indicator agrees with your totalizer.

At the first sign of trouble, the system should be shut down and the meter removed for inspection.

TOOLS LIST

The following list includes tools needed to service and maintain McCrometer propeller meters:

- Open or box end wrenches for top plate bolts (these vary with line size):

1/2"	for 2", 2 1/2", and 3" line sizes
9/16"	for 4", 6", and 8" line sizes
3/4"	for 10" and 12" line sizes
- Open or box end wrenches in the following sizes:

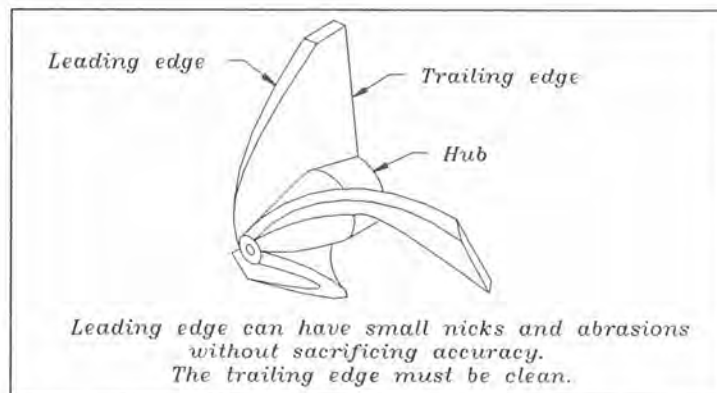
9/16"	for propeller nut
1 3/8"	for bearing assembly
15/16"	for register's pal nut
- Standard, flat screwdriver with 6" reach for canopy screws
- Wire cutters for removing lead seal
- Hammer
- Small wire brush for cleaning threads
- Clean cloth or rag
- Loctite (Arontite Stock CE-805-Color Blue is suggested)
- Light machine oil

DISASSEMBLY AND INSPECTION PROCEDURE

1. **REMOVE THE METER OR ELEMENT.** Depending on the model, remove the entire meter or the metering element (propeller, bearing and drive assemblies, and meterhead) to access the propeller and bearing assembly.

****WARNING**** Do not remove the meter or top plate under pressure!

2. **CHECK THE PROPELLER.** Check the propeller for broken or damaged blades or foreign material hanging from it. Careful examination should be made of the propeller's trailing edge for damage. Some small nicks and abrasions to the leading edge of the blades are common and will not affect the accuracy of the meter. McCrometer's propeller blades are thick, resulting in a strong, stiff blade that does not change shape under normal operations.



Check for propeller damage

Fig. 7

3. **CHECK THE BEARINGS.** Check the condition of the bearings by grasping the propeller and trying to move it up and down and sideways. If the propeller has any amount of "play," the bearing assembly should be replaced.
4. **REMOVE THE PROPELLER.** Remove the propeller by unscrewing the nut on the end of the propeller with a 9/16" wrench. Pull the propeller off the end of the bearing assembly shaft. Watch for the key, it may remain on the shaft, on the propeller, or fall free. If the propeller won't come off by hand, lightly tap the hub of the propeller with a hammer. Tap only the hub, since striking the trailing edge of the propeller blade may change the calibration of the meter. One or more stainless steel washers may be on the shaft. Leave these in place.
5. **REMOVE THE BEARING ASSEMBLY.** Remove the bearing assembly by unscrewing it with a 1 3/8" wrench. The drive cable may come out at this time. Set it aside for now. (A special bearing removal tool may be required for meters with fixed ells. These tools are available through Ketema/ McCrometer Division.) After removing the bearing assembly, hold the shaft and spin the bearing housing. It should spin freely and smoothly. If it doesn't, it should be replaced.
6. **CHECK.** Also check for corrosion on the threads and the small O-Ring groove at the end of the ell. It is critical that at this connection there is a leak-proof seal.

7. **REMOVE THE DRIVE CABLE.** Now pull the drive cable out of the ell and inspect it for moisture, rust, wear, cracks, or breaks. If a cable appears worn, this is usually a symptom of another problem, such as moisture.
8. **REMOVE THE REGISTER CANOPY.** Remove the register canopy by unscrewing the five short screws and the one long screw with the lead seal from around the base. Inspect the canopy and the base plate for signs of leaks.

****IMPORTANT**** Removing the lead seal from a meter that is still under warranty could void the factory warranty.

9. **REMOVE THE REGISTER HEAD.** Remove the register head by loosening the pal nut on the stem of the register with a 15/16" wrench. Unscrew the whole register unit. Inspect the register for moisture. Look for a white chalky substance on the frame of the register that shows the register was wet. Turn the very bottom of the register stem several times. The register movement should turn freely. The first odometer wheel also should turn. If not, the register should be returned for repair or exchange. The purpose of the silica gel dry pack is to absorb moisture trapped during assembly. Leave the silica pack in place.
10. If moisture exists inside the drive assembly, the liner should be taken out to dry. To remove the liner, use an item such as a large bolt to tap the liner down from the top. Tap enough to push the liner stop out from the bottom to allow the liner to be pulled free.

ORDERING REPLACEMENT PARTS

When ordering replacement parts, the meter's serial number is needed to ensure correct replacements. The serial number can be found on the register canopy lid. The number sequence should look similar to: 91-8-789. The first two digits are the year of manufacture, the second set of digits is the nominal line size, and the last set of digits is the number of the meter.

For specific meter part numbers, see the drawings that follow.

REASSEMBLY PROCEDURE

Now, with the problem found and the correct replacement parts collected, the meter must be correctly reassembled to ensure trouble-free service in the future.

1. **CLEAN ALL PARTS.** As with any mechanical device, all of the parts that are going to be reused must be clean and free of dust and dirt. Take some time and make sure these parts are ready to be used.
2. If the cable liner was removed, replace it now. Push the cable liner into the ell from the bottom up to the base plate. Replace the liner stop.
3. **CLEAN THE LINER.** Blow out any dirt that may be trapped inside the liner.
4. **REPLACE THE BEARING ASSEMBLY.** With a drop of light machine oil on your finger, lubricate the small O-Ring on the end of the threaded ell. (Don't get oil on the threads of ell.) Place two drops of loctite on the threads of the ell.

****IMPORTANT**** Use only two drops of loctite. Too much loctite can cause the aft bearing to seize.

This step is very important! Without the loctite, the bearing can work itself loose from the drive assembly. McCrometer recommends using Arontite Stock CE-805-Color Blue for best results. Thread the bearing assembly on the ell and tighten with a wrench or a special bearing tool. Be careful not to cross-thread the assembly and only snug the bearing assembly with the wrench. Extra care should be exercised in assuring that the parts are clean and the O-Ring has a good sealing area.

5. **REPLACE THE PROPELLER.** Make sure the washers on the propeller shaft are in place. Slide the propeller over the shaft. Align the shaft and propeller key ways and insert the key. You may need to use a screw driver to push the key to the fully engaged position. Apply a small amount of loctite to the threads of the nut and tighten to a good snug fit, but not as tight as possible.
6. **REPLACE THE DRIVE CABLE.** With a clean cloth, wipe off any dirt or dust from the drive cable. Apply a small amount of light machine oil to the cable and insert it all the way into the ell. To engage the cable, slowly turn the propeller as you gently push on the cable. After you are satisfied that the cable is in the bearing assembly as far as possible, check the height of the cable in relationship to the top of the mounting plate bushing. The cable should be within 1/4 of an inch (plus or minus) from the top of the bushing. If not, it's the wrong cable or the cable is not fully into the bearing assembly.
7. **REPLACE THE REGISTER HEAD.** Thread the pal nut, with the open face up, onto the stem on the bottom of the register. The nut should be at least halfway up the threads. Place the register stem on the drive cable and screw it into the mounting plate bushing. The register should be screwed down far enough that the cable is well into the register stem but not far enough to bind the cable. Face the register the desired direction and tighten the pal nut to lock the register into position.
8. **CHECK.** Spin the propeller to check that the rate-of-flow indicator and totalizer are engaged. Listen for any clicking or grinding noises. The meter should turn quietly.
9. **REPLACE THE REGISTER CANOPY.** Install the large O-Ring onto the base plate. Use a small amount of light oil to lubricate the O-Ring and place the register canopy down over it. Push down until the O-Ring bottoms out against the base plate. Replace the six screws and lightly snug them.
10. **REINSTALL THE FLOWMETER.** Reinstall the flowmeter. Before repressurizing the system, make sure all connections are properly secured. As an obvious general safety consideration, maintain a safe and prudent distance from the meter when the system is to be started. After the system restarts, the indicator should be smooth and the meter quiet.

TECHNICAL SUPPORT

For technical assistance, please contact your authorized service representative or the factory at:

Ketema/ McCrometer Division
3255 W. Stetson Avenue
Hemet, CA 92545
PHONE: (714) 652-6811 FAX: (714) 652-3078
Hours: 8 am-5 pm PST, Mon-Fri



NUMBER
MW500/MW600/MW900/MG900



TITLE
4" THRU 24" TOP PLATE METERS

R1 09-05-91 CEH F:\DWG\SALES\MW500MAN.DWG

C.E.H.

08-27-91

REV DATE & BY:

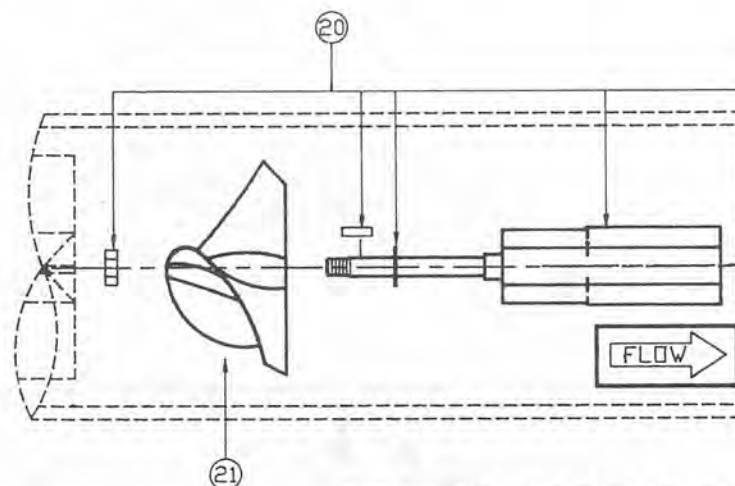
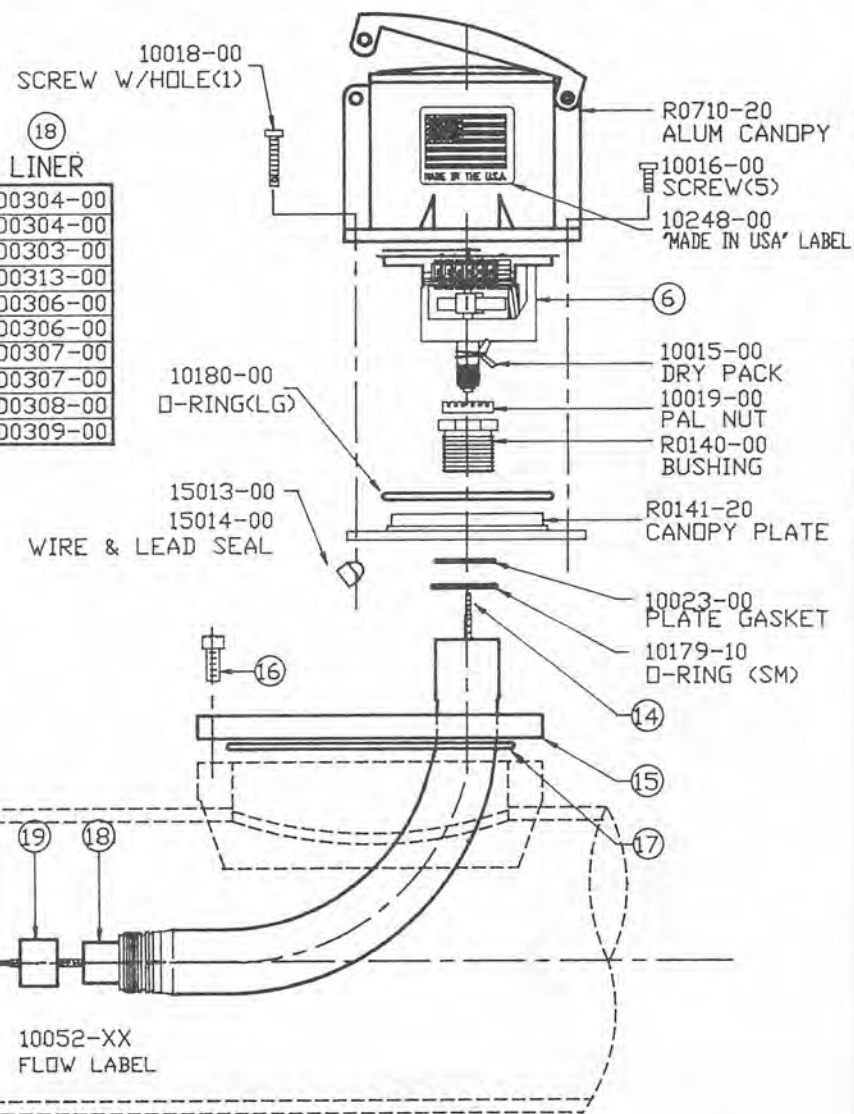
FILE NAME

DRAWN CHECKED APPROVED DATE

	⑥	②①	②②	①⑤	①⑦	①⑥	①④	①⑧
SIZE	REGISTER	PROPELLER	BEARING	ELL ASSY	D-RING	BOLT	CABLE	LINER
4"	R1104-XX	P0104-XX	B0600-XX	L0204-10	T0390-00	10103-00(8)	D0104-00	D0304-00
6"	R1106-XX	P0106-XX	B0100-XX	L0205-10	T0390-10	10103-00(8)	D0104-00	D0304-00
8"	R1108-XX	P0108-XX	B0100-XX	L0206-10	T0390-10	10103-00(8)	D0122-00	D0303-00
10"	R1110-XX	P0110-XX	B0100-XX	L0207-10	T0399-10	10050-00(12)	D0123-00	D0313-00
12"	R1112-XX	P0112-XX	B0100-XX	L0208-10	T0399-10	10050-00(12)	D0106-00	D0306-00
14"	R1114-XX	P0112-XX	B0100-XX	L0209-10	T0399-10	10050-00(12)	D0106-00	D0306-00
16"	R1116-XX	P0112-XX	B0100-XX	L0210-10	T0399-10	10050-00(12)	D0107-00	D0307-00
18"	R1118-XX	P0116-XX	B1500-XX	L0211-10	T0399-11	10099-00(16)	D0107-00	D0307-00
20"	R1120-XX	P0116-XX	B1500-XX	L0212-10	T0399-11	10099-00(16)	D0108-00	D0308-00
24"	R1124-XX	P0116-XX	B1500-XX	L0213-10	T0399-11	10099-00(16)	D0109-00	D0309-00

NOTES:

XX DEPENDS ON SPECIFIC REQUIREMENT



THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION
AND MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE NOR USED FOR MANUFACTURING PURPOSES WITHOUT WRITTEN PERMISSION FROM McCROMETER.

NUMBER

MW503/MW603/MW903/MG903



TITLE

3" TOP PLATE METERS

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C.E.H.

08-29-91

REV DATE & BY:

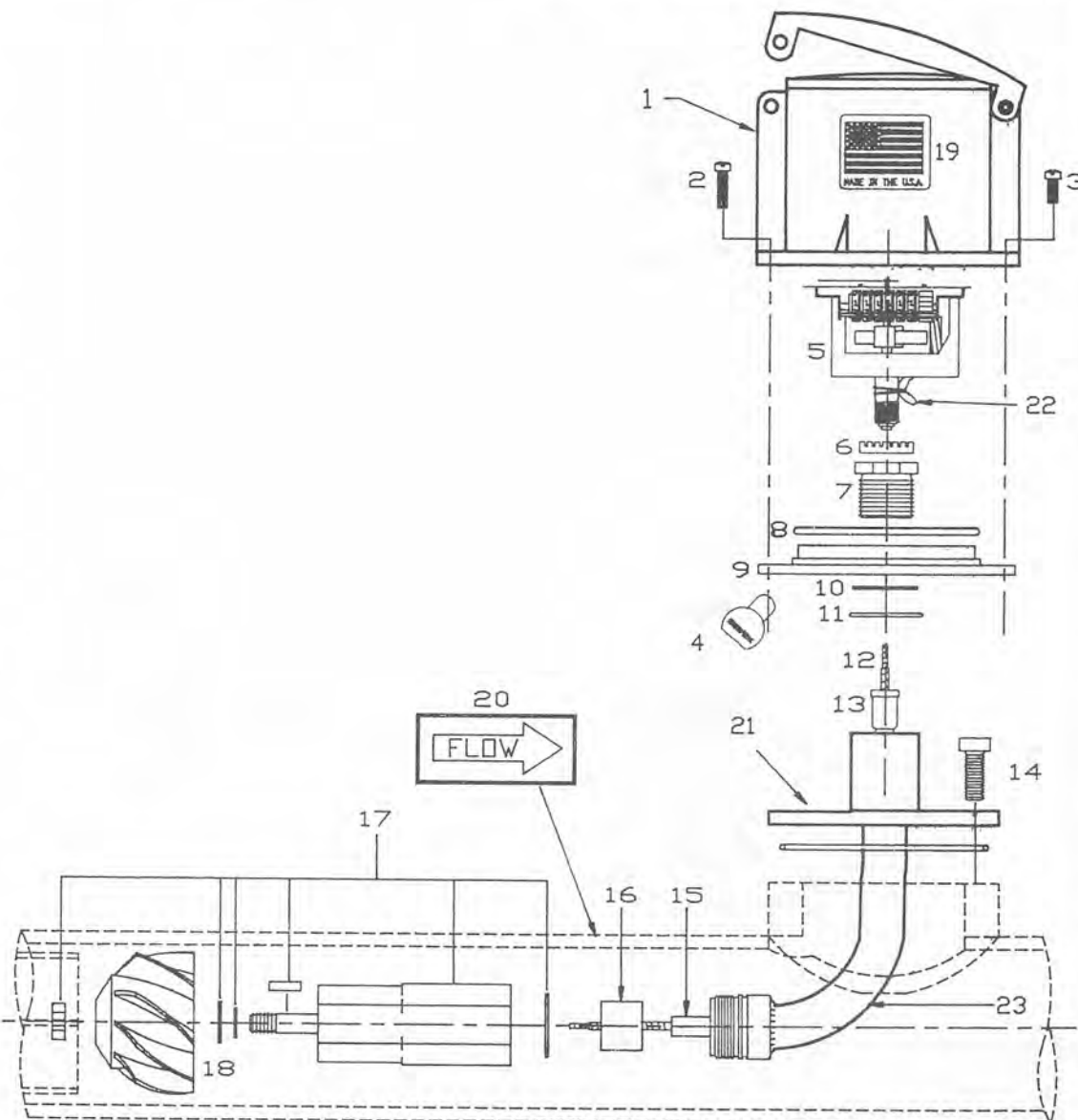
FILE NAME

DRAWN CHECKED APPROVED DATE

REF	Q	PART #	DESCRIPTION
1	1	R0710-20	ALUM CANOPY
2	1	10018-00	SCREW W/HOLE
3	5	10016-00	SCREW
4	1	15013-00	SEALING WIRE
4	1	15014-00	LEAD SEAL
5	1	R1103-XX	REGISTER
6	1	10019-00	PAL NUT
7	1	R0140-00	BUSHING
8	1	10180-00	O-RING (LARGE)
9	1	R0141-20	BASE PLATE
10	1	10023-00	GASKET
11	1	10179-10	O-RING (SMALL)
12	1	D0066-00	CABLE
13	1	D0362-00	UPPER STOP
14	6	10049-00	BOLT
15	1	D0332-00	LINER
16	1	D0370-00	LOWER STOP
17	1	B0700-XX	BEARING ASSEMBLY
18	1	P0103-XX	PROPELLER
19	1	10248-00	MADE IN USA LABEL
20	1	10052-14	FLOW LABEL
21	1	10051-00	SAFETY LABEL
22	1	10015-00	DRY PACK
23	1	L0203-10	TOP PLATE ASSY.

NOTES:

XX DEPENDS ON SPECIFIC REQUIREMENT



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NUMBER
MD300/M0300



TITLE
6' THRU 16' BOLT-ON SADDLE METERS

R1 09-05-91 CEH F:\DWG\SALES\M0300MAN.DWG

C.E.H.

08-29-91

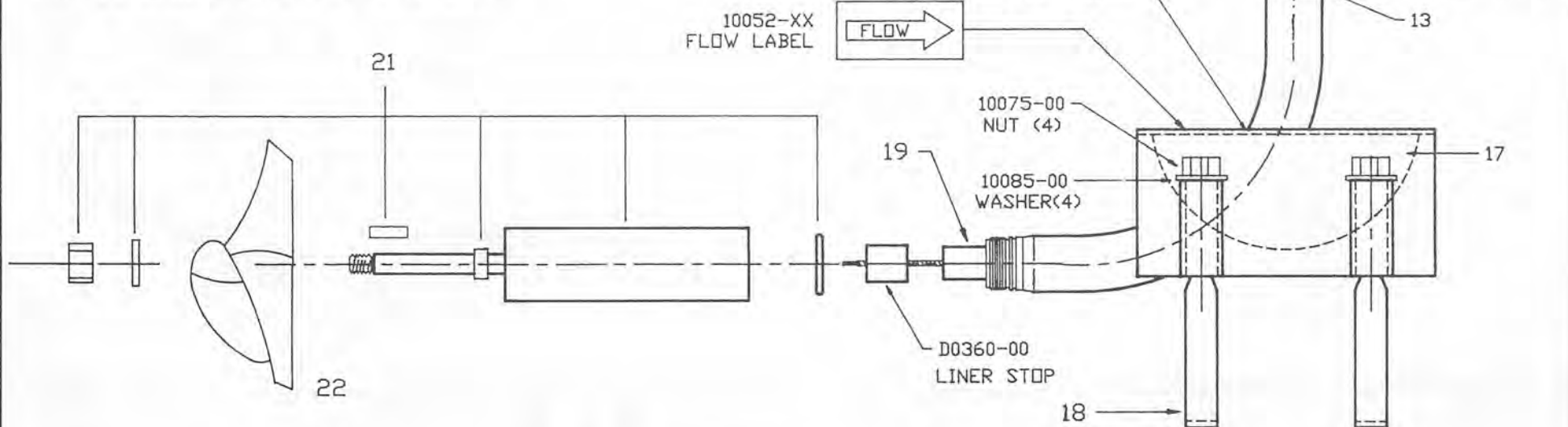
REV DATE & BY:

FILE NAME

DRAWN CHECKED APPROVED DATE

	4	22	21	18	13	19	17	NOT SHOWN
MODEL	REG	PROP	BEARING	U-BOLT	CABLE	LINER	GASKET	TEMPLATE
MD306	R1106-XX	PT106-XX	B0100-XX	T0756-00(2)	D0104-00	D0304-00	T0384-10	10112-03
MD308	R1108-XX	PT108-XX	B0100-XX	T0758-00(2)	D0104-00	D0304-00	T0384-10	10112-05
MD310	R1110-XX	PT110-XX	B0100-XX	T0760-00(2)	D0122-00	D0305-00	T0384-11	10112-07
MD312	R1112-XX	PT112-XX	B0100-XX	T0762-00(2)	D0105-00	D0305-00	T0384-11	10112-09
MD314	R1114-XX	PT112-XX	B0100-XX	T0763-00(2)	D0123-00	D0313-00	T0384-11	10112-09
MD316	R1116-XX	PT112-XX	B0100-XX	T0764-00(2)	D0123-00	D0313-00	T0384-11	10112-09
M0306	R1106-XX	P0106-XX	B0100-XX	T0756-00(2)	D0104-00	D0304-00	T0384-10	10112-03
M0308	R1108-XX	P0108-XX	B0100-XX	T0758-00(2)	D0104-00	D0304-00	T0384-10	10112-05
M0310	R1110-XX	P0110-XX	B0100-XX	T0760-00(2)	D0122-00	D0305-00	T0384-11	10112-07
M0312	R1112-XX	P0112-XX	B0100-XX	T0762-00(2)	D0105-00	D0305-00	T0384-11	10112-09
M0314	R1114-XX	P0112-XX	B0100-XX	T0763-00(2)	D0123-00	D0313-00	T0384-11	10112-09
M0316	R1116-XX	P0112-XX	B0100-XX	T0764-00(2)	D0123-00	D0313-00	T0384-11	10112-09

NOTE:
XX DEPENDS ON SPECIFIC REQUIREMENT



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NUMBER

M0304


KEMA
MCCROMETER

TITLE

4" BOLT-ON SADDLE METER

R3 09-06-91 CEH F: DWG\SALES\M0304MAN.DWG

R.N.P.

06-06-88

REV DATE & BY:

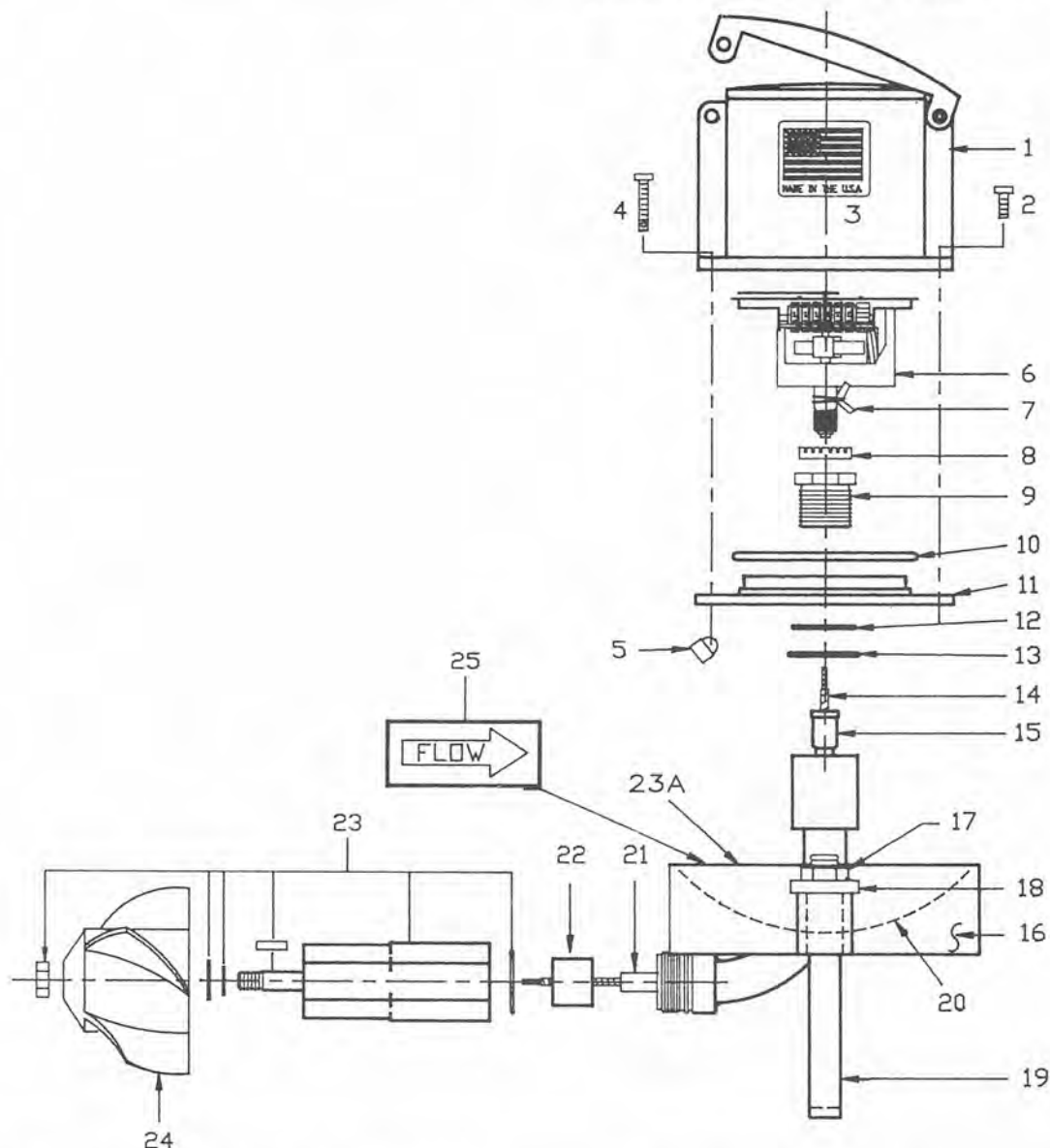
FILE NAME

DRAWN CHECKED APPROVED DATE

REF	QTY	PART #	DESCRIPTION
1	1	R0710-20	ALUM CANOPY
2	5	10016-00	SCREW
3	1	10248-00	MADE IN "USA" LABEL
4	1	10018-00	SCREW W/HOLE
5	1	15013-00	SEALING WIRE
5	1	15014-00	LEAD SEAL
6	1	R1104-XX	REGISTER
7	1	10015-00	DRY PACK
8	1	10019-00	PAL NUT </td
9	1	R0140-00	BUSHING
10	1	10180-00	O-RING (LARGE)
11	1	R0141-20	BASE PLATE
12	1	10023-00	GASKET
13	1	10179-10	O-RING (SMALL)
14	1	D0066-00	CABLE
15	1	D0362-00	UPPER STOP
	1	10112-01	HOLE TEMPLATE
16	1	T0254-11	4" STD SADDLE
17	2	10071-00	NUT
18	2	10084-00	WASHER
19	1	T0754-00	U-BOLT
20	1	T0384-00	GASKET
21	1	D0318-00	LINER
22	1	D0370-00	LOWER STOP
23	1	B0600-XX	BEARING ASSEMBLY
23A	1	10051-XX	SAFETY LABEL
24	1	P0104-XX	4" STD PRDP
25	1	10052-14	FLOW LABEL

NOTES:

XX DEPENDS OF SPECIFIC REQUIREMENT



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NUMBER
MF100/MG100/MS100



TITLE
FIXED ELL METERS

R1 09-05-91 CEH F:\DWG\SALES\FXDELMAN.DWG

C.E.H. 08-26-91

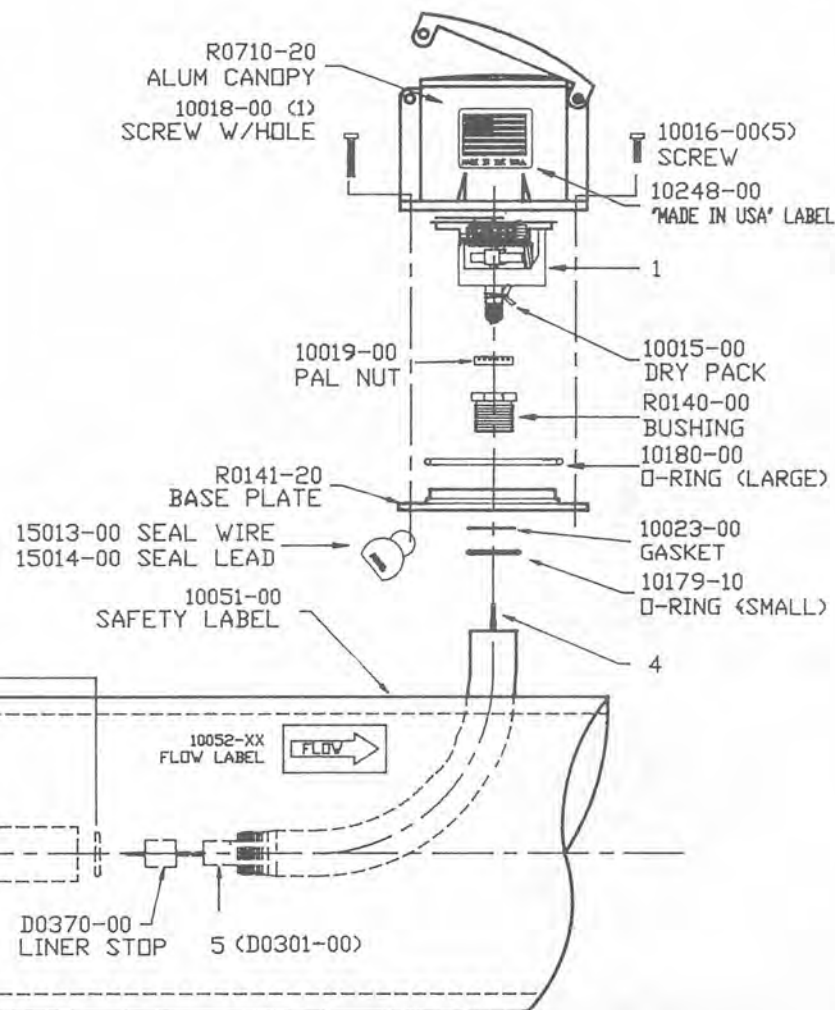
REV DATE & BY:

FILE NAME

DRAWN CHECKED APPROVED DATE

	①	②	③	④	⑤
SIZE	REGISTER	BEARING	PROP	CABLE	LINER
4"	R1104-XX	B0600-XX	P0104-XX	D0104-00	10"
6"	R1106-XX	B0100-XX	P0106-XX	D0104-00	10"
8"	R1108-XX	B0100-XX	P0108-XX	D0104-00	10"
10"	R1110-XX	B0100-XX	P0110-XX	D0122-00	12"
12"	R1112-XX	B0100-XX	P0112-XX	D0105-00	12"
14"	R1114-XX	B0100-XX	P0112-XX	D0123-00	13"
16"	R1116-XX	B0100-XX	P0112-XX	D0123-00	13"
18"	R1118-XX	B1500-XX	P0116-XX	18.19"	16"
20"	R1120-XX	B1500-XX	P0116-XX	18.19"	16"
24"	R1124-XX	B1500-XX	P0116-XX	20.187"	18"

TABLE



NOTES:
XX DEPENDS ON SPECIFIC REQUIREMENT

NUMBER

MF103/MG103/MS103



TITLE

3" FIXED ELL METER

R1 09-05-91 CEH F:\DWG\SALES\3INFXDEL.DWG

C.E.H.

08-29-91

REV DATE & BY:

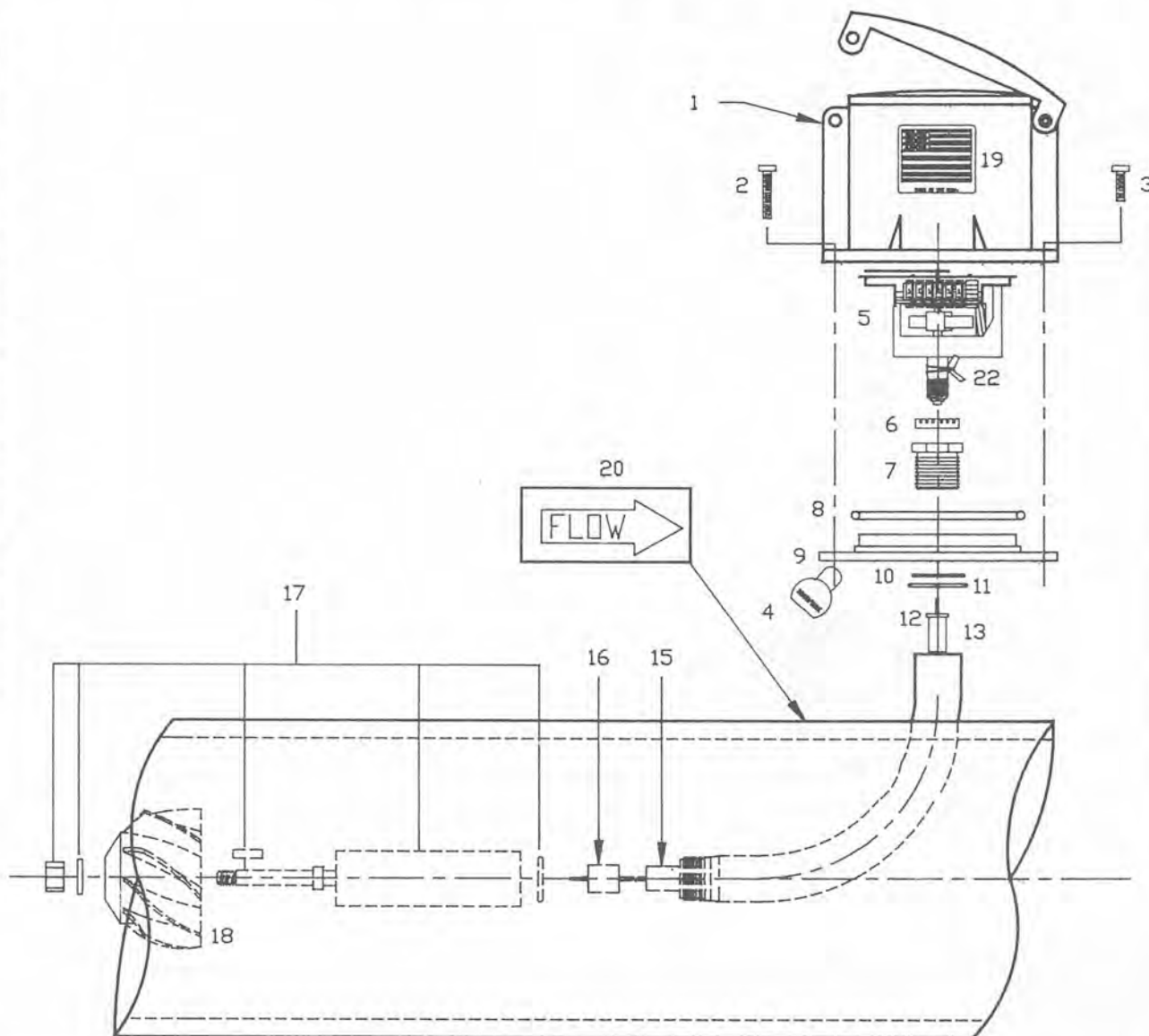
FILE NAME

DRAWN CHECKED APPROVED DATE

REF	Q	PART #	DESCRIPTION
1	1	R0710-20	ALUM CANOPY
2	1	10018-00	SCREW W/HOLE
3	5	10016-00	SCREW
4	1	15013-00	SEALING WIRE
4	1	15014-00	LEAD SEAL
5	1	R1103-XX	REGISTER
6	1	10019-00	PAL NUT
7	1	R0140-00	BUSHING
8	1	10180-00	O-RING (LARGE)
9	1	R0141-20	BASE PLATE
10	1	10023-00	GASKET
11	1	10179-10	O-RING (SMALL)
12	1	D0066-00	CABLE
13	1	D0362-00	UPPER STOP
15	1	D0318-00	LINER
16	1	D0370-00	LOWER STOP
17	1	B0700-XX	BEARING ASSEMBLY
18	1	P0103-XX	PROPELLER
19	1	10248-00	MADE IN USA LABEL
20	1	10052-14	FLOW LABEL
21	1	10051-00	SAFETY LABEL
22	1	10015-00	DRY PACK

NOTES:

XX DEPENDS ON SPECIFIC REQUIREMENT



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NUMBER

M1104



TITLE

FIRE HYDRANT METER PARTS

R1 09-06-91 CEH F:\DWG\SALES\M1104MAN.DWG

C.E.H.

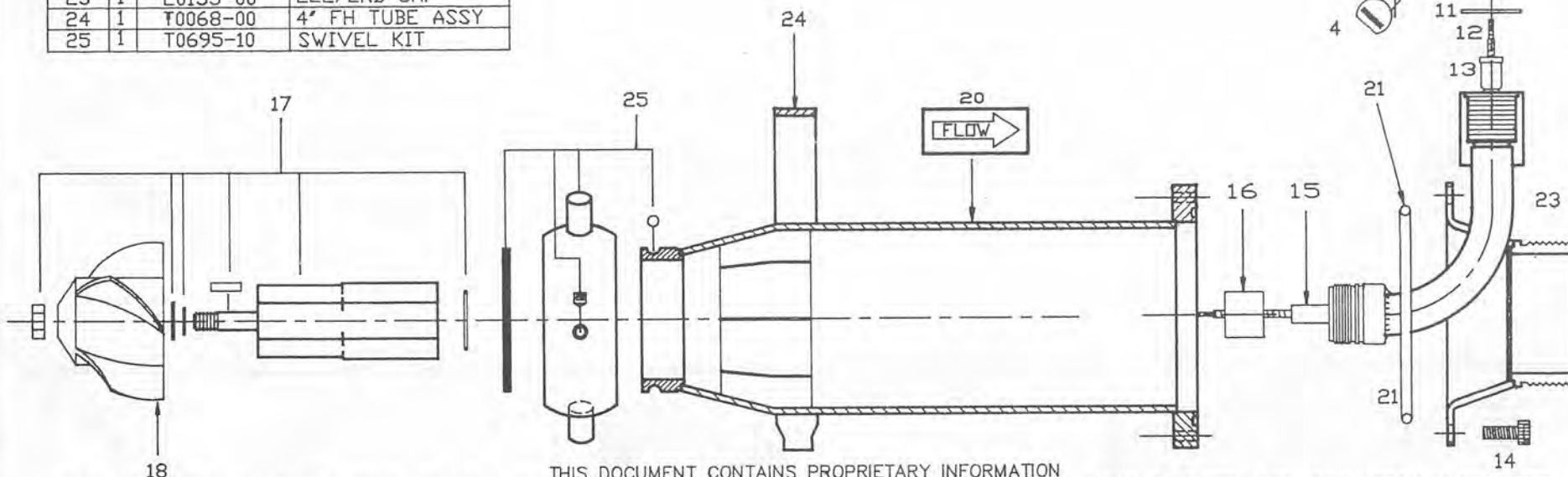
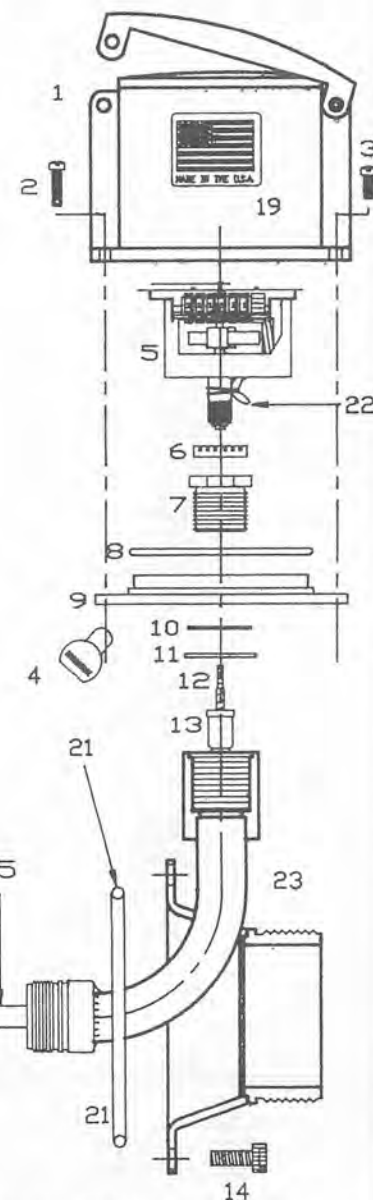
08-09-91

REV DATE & BY:

FILE NAME

DRAWN CHECKED APPROVED DATE

REF	Q	PART #	DESCRIPTION
1	1	R0710-20	ALUM CANOPY
2	1	10018-00	SCREW W/HOLE
3	5	10016-00	SCREW
4	1	15013-00	SEALING WIRE
4	1	15014-00	LEAD SEAL
5	1	R1104-XX	REGISTER
6	1	10019-00	PAL NUT
7	1	R0140-00	BUSHING
8	1	10180-00	O-RING (LARGE)
9	1	R0141-20	BASE PLATE
10	1	10023-00	GASKET
11	1	10179-10	O-RING (SMALL)
12	1	D0066-00	CABLE
13	1	D0362-00	UPPER STOP
14	6	10049-11	BOLT
15	1	D0318-00	LINER
16	1	D0370-00	LOWER STOP
17	1	B0700-XX	BEARING ASSEMBLY
18	1	PT104-XX	PROPELLER
19	1	10248-00	'MADE IN USA' LABEL
20	1	10052-14	FLOW LABEL
21	1	T0390-00	O-RING
22	1	10015-00	DRY PACK
23	1	L0155-00	ELL/END CAP
24	1	T0068-00	4" FH TUBE ASSY
25	1	T0695-10	SWIVEL KIT



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NUMBER

ML100



TITLE

IRRIGATION FLANGED METERS

R1 09-05-91 CEH F:\DWG\SALES\ML100MAN.DWG

C.E.H.

08-29-91

REV DATE & BY:

FILE NAME

DRAWN CHECKED APPROVED DATE

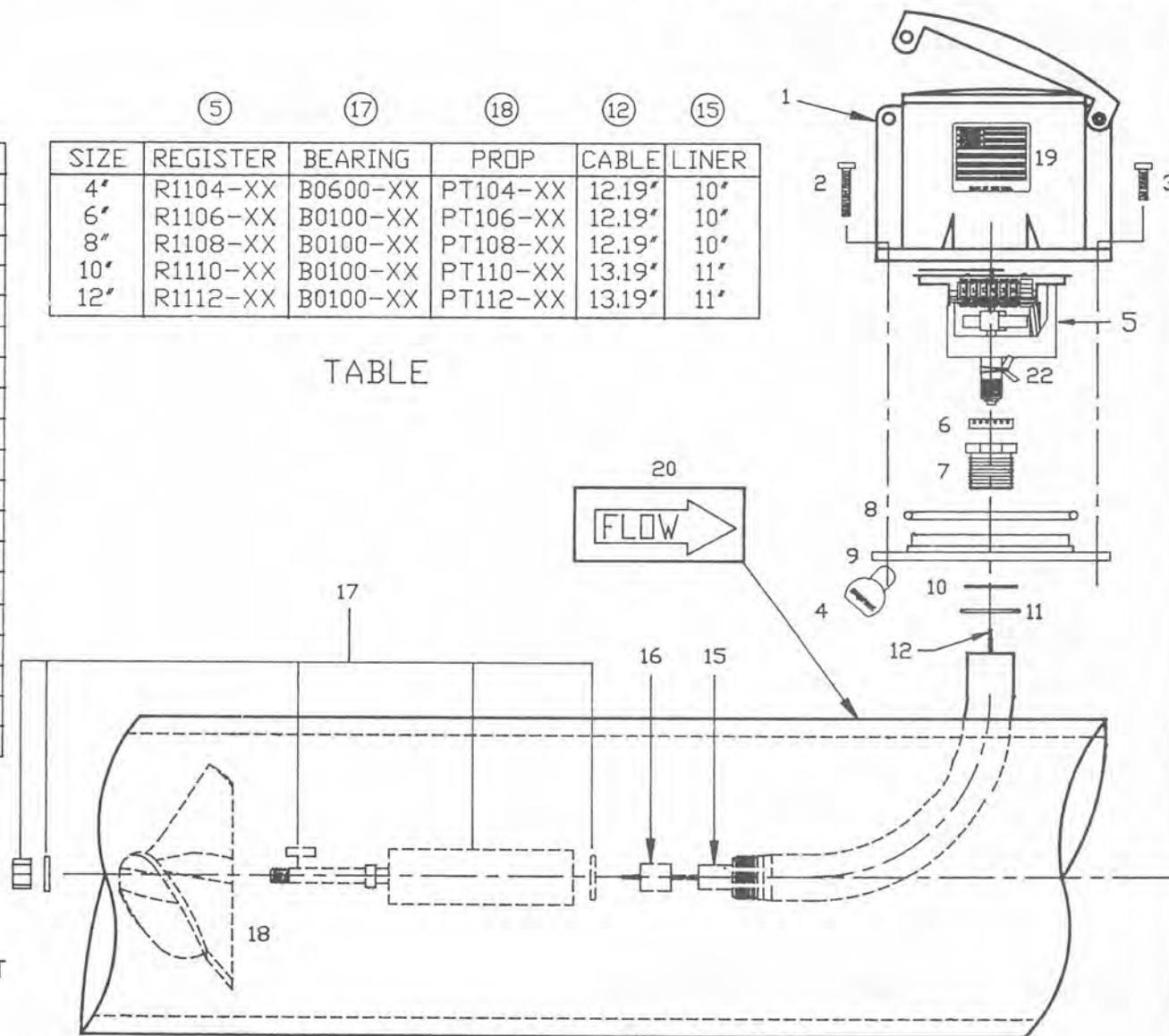
COMMON METER PARTS

REF QTY PART # DESCRIPTION

1	1	R0710-20	ALUM CANDPY
2	1	10018-00	SCREW W/HOLE
3	5	10016-00	SCREW
4	1	15013-00	SEALING WIRE
4	1	15014-00	LEAD SEAL
5	1	*	REGISTER
6	1	10019-00	PAL NUT
7	1	R0140-00	BUSHING
8	1	10180-00	O-RING (LARGE)
9	1	R0141-20	BASE PLATE
10	1	10023-00	GASKET
11	1	10179-10	O-RING (SMALL)
12	1	*	CABLE
15	1	*	LINER
16	1	D0370-00	LOWER STOP
17	1	*	BEARING ASSEMBLY
18	1	*	PROPELLER
19	1	10248-00	'MADE IN USA' LABEL
20	1	10052-14	FLOW LABEL
22	1	10015-00	DRY PACK

	(5)	(17)	(18)	(12)	(15)
SIZE	REGISTER	BEARING	PROP	CABLE	LINER
4"	R1104-XX	B0600-XX	PT104-XX	12.19'	10'
6"	R1106-XX	B0100-XX	PT106-XX	12.19'	10'
8"	R1108-XX	B0100-XX	PT108-XX	12.19'	10'
10"	R1110-XX	B0100-XX	PT110-XX	13.19'	11'
12"	R1112-XX	B0100-XX	PT112-XX	13.19'	11'

TABLE



NOTES:

XX DEPENDS ON SPECIFIC REQUIREMENT

* SEE TABLE

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